

The larvae of *Agrilus australasiae* Laporte & Gory and *Ethon affine* Laporte & Gory

(Insecta: Coleoptera: Buprestidae)

By M. G. Volkovitsh and T. J. Hawkeswood*

M. G. Volkovitsh & T. J. Hawkeswood. (1989): The larvae of *Agrilus australasiae* Laporte & Gory and *Ethon affine* Laporte & Gory (Insecta: Coleoptera: Buprestidae). — Spixiana 13/1: 43–59

The larva/prepupa of *Agrilus australasiae* Laporte & Gory is described from material collected during October 1987 from Hastings Point, north-eastern New South Wales, Australia. The larva/prepupa of *Ethon affine* Laporte & Gory is described from material collected during 1977 and 1982 from the Sydney district, New South Wales, Australia. The larva of *A. australasiae* has close affinities with other known *Agrilus* larvae (subfamily Agrilinae, tribe Agrilini) from the Northern Hemisphere. However, the larva of *E. affine* differs significantly from other known Coraebini and Agrilini larvae. Based on larval morphology, it is possible that *Ethon* is intermediate between the subfamilies Agrilinae and Trachyinae. This suggests that the Australian *Ethon* should be placed, at the least, in a new tribe when studies of other species and related Australian genera are completed.

M. G. Volkovitsh, Zoological Institute, Academy of Sciences of the USSR, 199034 Leningrad, USSR.

T. J. Hawkeswood, 49 Venner Road, Annerley, Brisbane, 4103 Queensland, Australia.

Introduction

The general biology and taxonomy of the Australian genera *Agrilus* and *Ethon* are poorly known. *Agrilus*, a worldwide group, is represented in Australia by about 20 species (Carter 1929, Obenberger 1959), while *Ethon* is a small genus of about six described species restricted to eastern and southern Australia (Carter 1929). Previous biological information on the larval and adult food plants of *Ethon affine* Laporte & Gory have been provided by Froggatt (1892), Hawkeswood & Peterson (1982), Williams & Williams (1983) and Hawkeswood (1988), while Hawkeswood (1981) has provided ecological and behavioural observations on *Agrilus australasiae* Laporte & Gory and further observations on its biology will be provided elsewhere. The data on the biology and larvae of both species is fragmentary and incomplete. Through the courtesy of Mr C. E. Chadwick of Sydney we have obtained last instar (as well as other instar larvae and prepupae) of *E. affine* and recently one of us (TJH) has collected the larvae/prepupae with associated adults of *A. australasiae*. On the basis of this material, the larvae/prepupae are described below. The terminology used for these descriptions generally follows that of

* Reprint requests to T. J. Hawkeswood

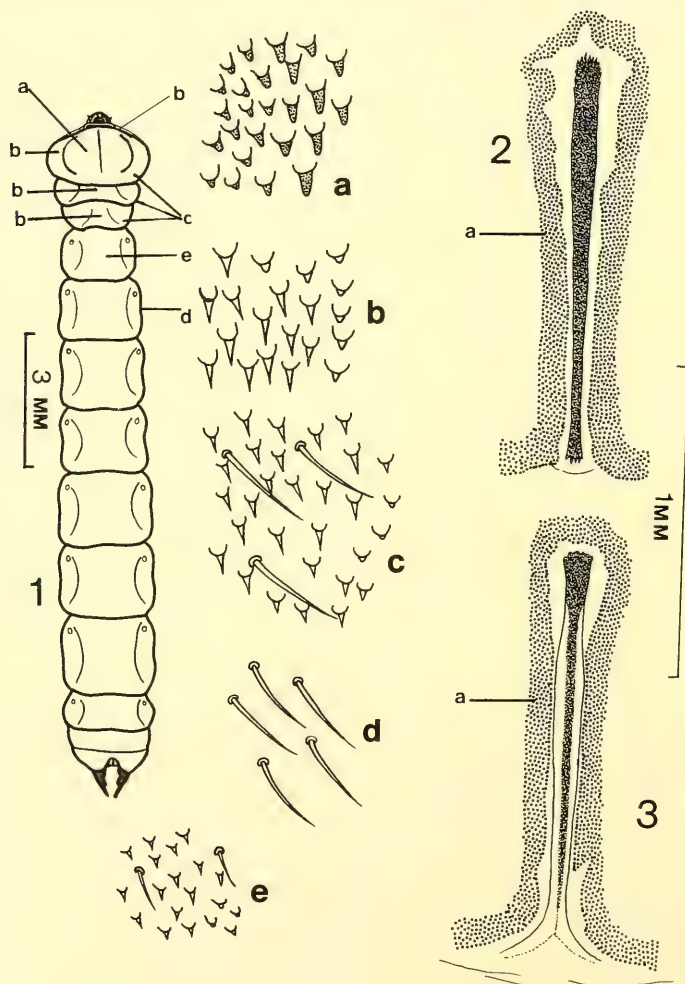
Alexeev (1960), Volkovitsh (1979), Volkovitsh & Danilevsky (1987) and Volkovitsh & Hawkeswood (1987 and corrections listed at the end of this paper).

Larval descriptions

Agrilus australasiae Laporte & Gory

(Figs 1–13)

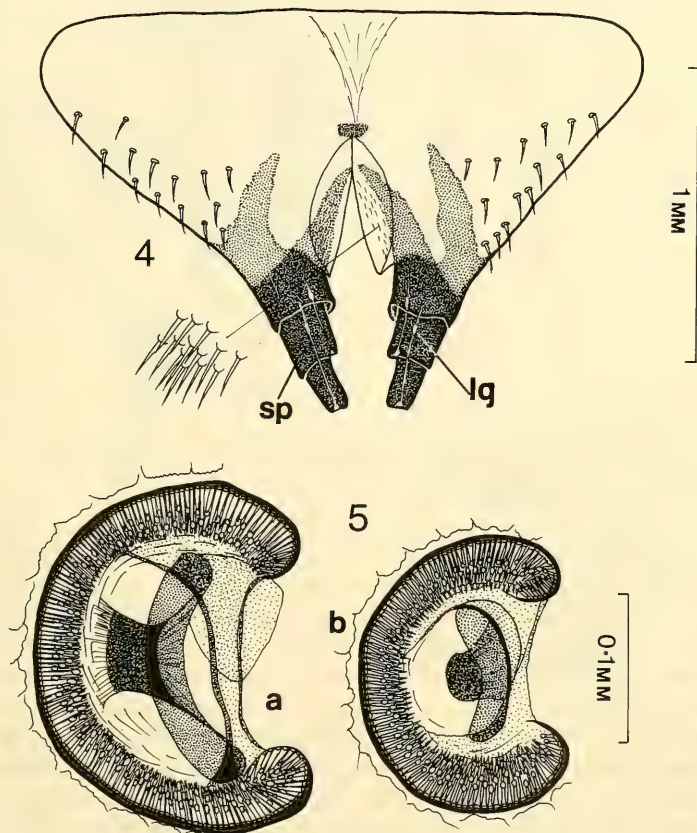
Length of the last instar larva and prepupa 10.4–15.5 mm. Larva is of the typical agrilinoid type (Figs 1, 13) with enlarged thoracic segments and heavily sclerotized anal supporting processes (Fig. 4,



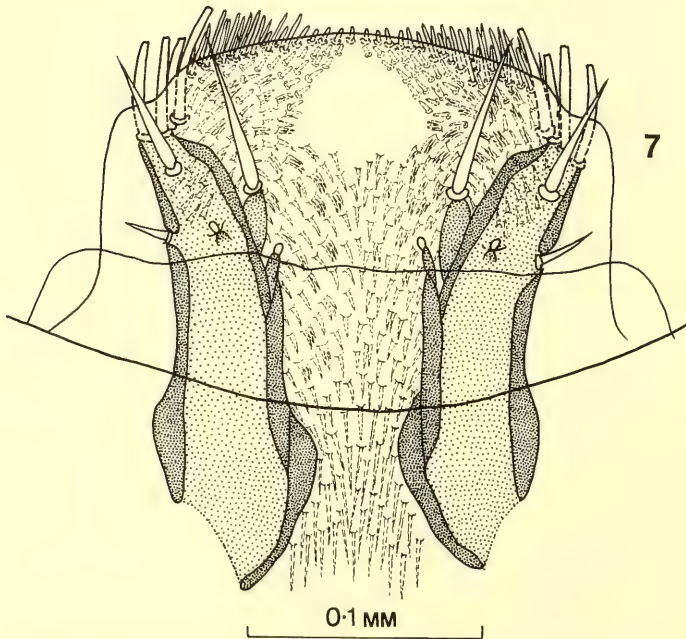
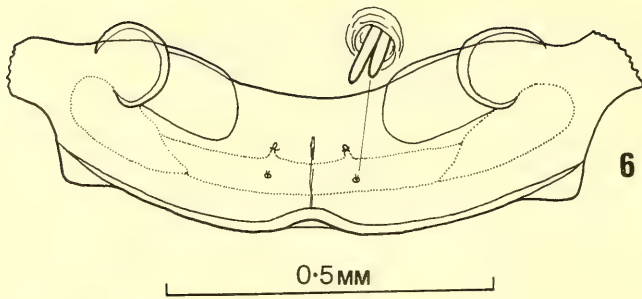
Figs 1–3. *Agrilus australasiae* Laporte & Gory. 1. Dorsal view of larva/prepupa. a. Microteeth on the pronotal plate; b. Microspinulae on the lateral part of the pronotum and central part of the meso- and metanotum; c. Microspinulae and bristles on the lateral parts of the pro-, meso- and meta-notum; d. Bristles on the lateral parts of the 2nd abdominal segment; e. Microspinulae and bristles on the dorsal and ventral parts of the 1st abdominal segment. 2. Shape of pronotal groove surrounded by microteeth (a). 3. Shape of prosteral groove surrounded by microteeth (a).

sp). Body whitish with yellowish prothoracic plates, brown mouthparts, prothoracal grooves, spiracles and anal supporting processes. Prothorax about the same width as abdominal segments 3–8.

Head and mouthparts. Epistome (Fig. 6) prominently transverse, about 4.0–4.5 times wider than long; anterior margin weakly sinuate between the mandibular condyles; posterior margin bisinuate between the lateral tentorial pits; epistome with prominently blunt posterior angles and bearing 2 pairs of epistomal sensory pits in the centre, arranged one directly below the other; upper pits each contain one sunken sensilla and the lower pits contain 2 basiconic sensillae (Fig. 6). Clypeus (Fig. 7) narrow, membranous, glabrous, anterior margin almost straight. Labrum (Fig. 7) transverse, about 1.4 times wider than long, mostly membranous but bearing very distinctive palantine sclerites with 4 long bristles, 2 short bristles and 4 campaniform sensillae on the external surface and 8 large, blunt bristles on the internal surface; anterior margin weakly arcuate between sharp lateral angles, without bristles, setae or microspinulae on the external surface. Epipharynx with a very dense covering of short blunt bristles of varying lengths and sharp microspinulae. Antennae (Fig. 9): 2-segmented, 1st segment broadly cylindrical, strongly sclerotized, about 1.0–1.2 times wider than long, with one campaniform sensilla on the lower half of the internal lateral margin and a fringe of microspinulae around the apex (anterior margin); 2nd segment about as long as wide, conical, with a very long, sharp seta (trichosensilla) near the apex, a prominent sensory appendage (*sa*), 2 scarcely discernable palmate sen-



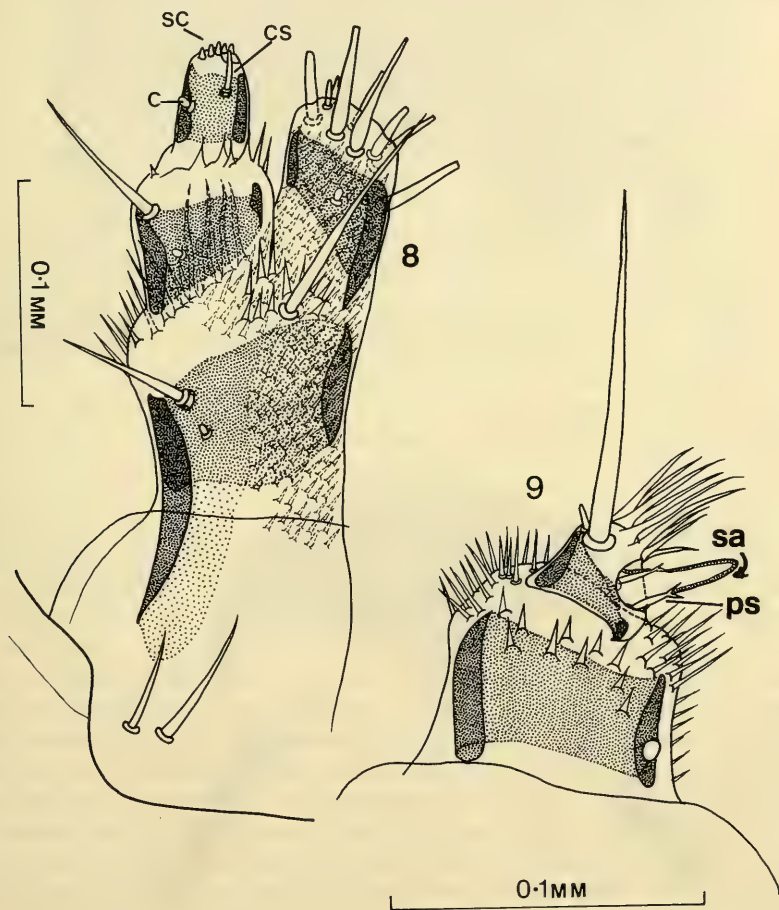
Figs 4–5. *Agrilus australasiae* Laporte & Gory. 4. Anal segment showing distribution of bristles, lubricating glands (*lg*) and the anal supporting processes (*sp*). 5 a. Thoracical right spiracle. 5 b. Left spiracle of the 3rd abdominal segment.



Figs 6–7. *Agrilus australasiae* Laporte & Gory. 6. Epistome and epistomal sensory pits. 7. Labrum.

sillae (*ps*), one elongated basiconic sensilla at the base of the sensory appendage and a tuft of long, sharp ciliae at the apex. Mandibles (Figs 10, 11): black, short, broad at the base, without teeth at the apex; internal margin with prosteca (*ps*) bearing very short, dense bristles; mandibles correspond to those of the 1st morpho-ecological type of *Acmaeoderella* larvae (Volkovitsh 1979). Labio-maxillary complex (Figs 8, 12): Maxillae (Fig. 8): Maxillary basis (*cardo*) mostly membranous, glabrous except for 2 elongated setae (one longer than the other) at the base. Stipes (Fig. 8) heavily sclerotized, bearing one small campaniform sensilla in the lower half towards the external lateral margin and one sharp bristle on the sclerotized region just above the campaniform sensilla, and one elongate, sharp bristle near the anterior margin below the mala; there is a fringe of microspinulae around the base of the internal bristle, with ciliae at the apex (anterior margin mainly internally), and microspinulae on the internal surface near the internal margin. Maxillary palpus (Fig. 8): 2-segmented, basal segment strongly sclerotized, about 1.0–1.2 times wider than long, the basal segment with a long, sharp seta arising from near the anterior-lateral margin and a campaniform sensilla situated below the middle towards the lateral mar-

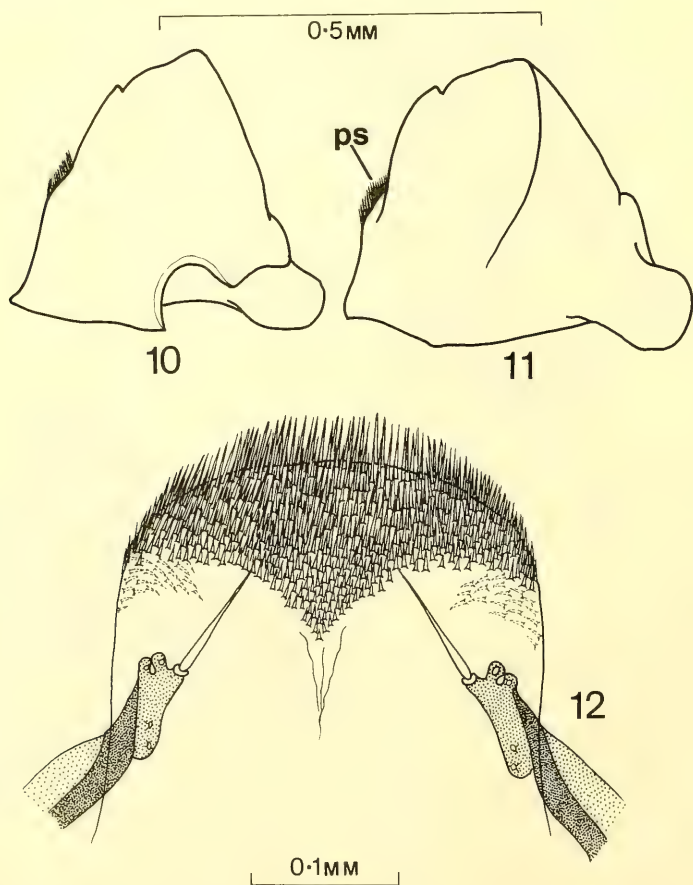
gin; anterior margin with a fringe of microspinulae; 2nd segment about 1.5–1.6 times longer than wide, with one campaniform sensilla (*c*) at the external margin, one modified curved sensilla (*cs*) internally near the anterior margin and 5–7 small, conical sensory structures (*sc*) at the apex. Mala (Fig. 8): strongly sclerotized, about 1.5–1.6 times longer than wide, bearing one campaniform sensilla in the centre and 2–3 thick bristles externally and 5 large, thick, mostly blunt bristles internally; internal surface with a dense covering of microspinulae. Labium (Fig. 12) weakly transverse, about 1.4 times longer than wide, with a broadly arcuate anterior margin, with dense microspinulae externally changing to longer bristles at the anterior margin; microspinulae and bristles form a triangular-shaped zone extending about $\frac{2}{3}$ the distance from the anterior margin to the level of the level of the bases of the setae situated at the lateral (corner) sclerites of the prementum; lateral sclerites well developed, each bearing 5 small campaniform sensillae and a sharp seta reaching the level of about the middle of the prementum. Hypopharynx with microspinulae situated at the anterior and lateral parts of the prementum only. Postmentum without bristles.



Figs 8–9. *Agrilus australasiae* Laporte & Gory. 8. Left maxilla showing cardo, stipes, maxillary palpus, bristles, microspinulae and specialized sensory structures- sensory cones (*sc*), curved sensilla (*cs*) and campaniform sensilla (*c*). 9. Antenna showing armature, sensory appendage (*sa*) and palmate sensillae (*ps*).

Thorax (Figs 1–3). Prothoracical plates completely covered with heavily sclerotized microteeth situated on small rounded tubercles (Fig. 1 a), a few, usually very rare short bristles may also be present. Pronotal groove (Fig. 2) very distinct, dark brown, widened towards apex, widened but not bifurcate at the base. Prosternal groove (Fig. 3) clearly defined, weakly sclerotized, light brown, slightly widened at the anterior $\frac{1}{3}$. Lateral margins of prothorax and dorsal and ventral surfaces and lateral margins of mesothorax and metathorax with microteeth, bristles and tubercles with reduced microteeth at their apex (Fig. 1 b, c). Thorax without ambulatory pads and rudiments of legs.

Abdomen (Fig. 1). Abdominal segments pale cream in colour (often darkening in alcohol), transverse, flattened; 1st segment about same width as the mesothorax (about 1.5 times wider than long and slightly narrower than the width of the other abdominal segments), without ambulatory pads; segments 2–4 of similar size, slightly wider than the 1st segment; segments 5–8 of similar size, widest of the abdominal segments, segment 9 about twice as wide as long, segment 10 (anal segment, Fig. 1, 4) bearing bristles, zones of microspinulae around anal opening and large, heavily sclerotized supporting processes at the apex with 2 lubricating glands with excretory ducts internally. Dorsal surface of abdomen nearly glabrous, with small zones of microteeth and bristles of rare occurrence (Fig. 1 e), lateral margins of abdomen with bristles (Fig. 1 d) almost without microteeth. Ventral surface of abdomen,



Figs 10–12. *Agilus australasiae* Laporte & Gory. 10. Right mandible, dorsal view. 11. Left mandible, ventral view, showing prosteca (*ps*). 12. Labium.

in the centre at least, with large zones of microteeth (Fig. 1 e) laterally. Spiracles (Fig. 5 a, b) of the circular type, heavily sclerotized, with relatively elongate, unbranched trabeculae. Thoracic and abdominal spiracles are similar and differ only in size.

Material examined. 3 last instar larvae/prepupae, Hastings Point, New South Wales, Australia, ex dead, dry stems of *Acacia sophorae* (Labill.) R. Br. (Mimosaceae), in disturbed sand-dune beach habitat, October 1987, collector T. J. Hawkeswood.

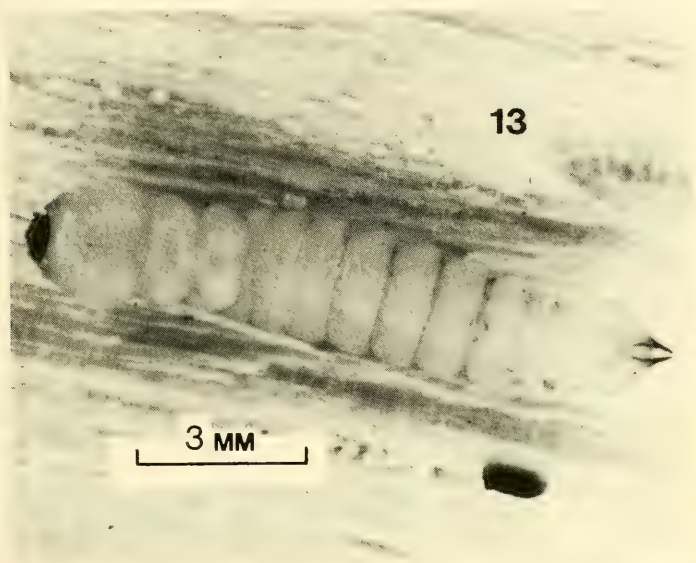


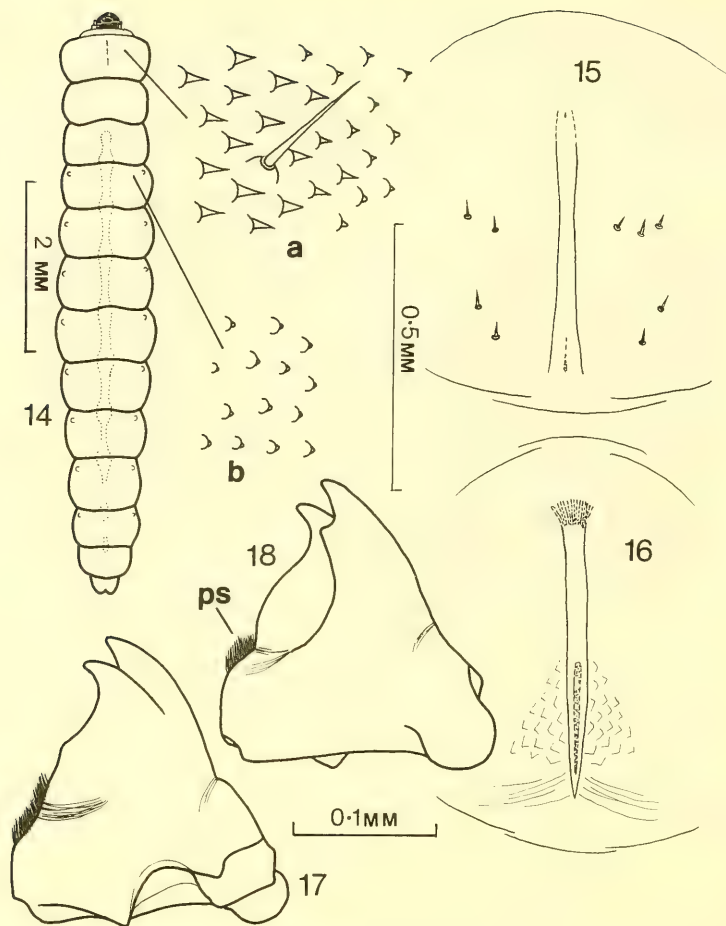
Fig. 13 Last instar larva/prepupa of *Agrilus australasiae* Laporte & Gory freshly collected from the dead wood of *Acacia sophorae* (Labill.) R. Br. (Mimosaceae). Photo: T. J. Hawkeswood.

Ethon affine Laporte & Gory

(Figs 14–27)

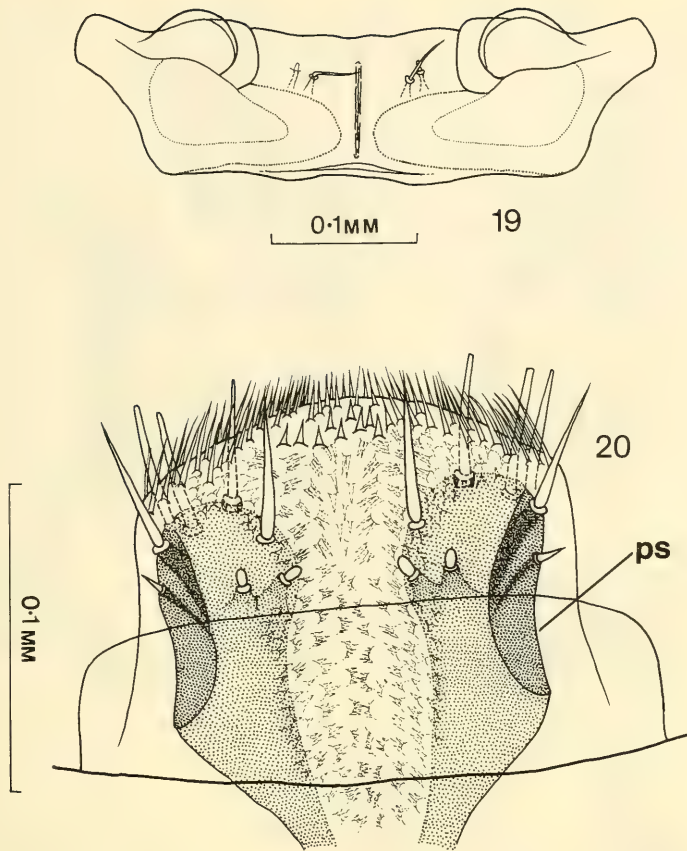
Length of the last instar larva and prepupa 6.7–11.9 mm. Larva is of a special type similar in gross morphology to that of the typical Cerambycidae larva, without enlarged and flattened prothorax and broad meso- and meta- thorax, maximum width at about the level of abdominal segments 3–5 (Figs 14, 27). Body whitish to cream, apodous, very weakly sclerotized except for mandibles, epistome, hypostome and spiracles.

Head and mouthparts. Epistome (Fig. 19) very transverse, about 4.0 times wider than long; anterior and posterior margins almost straight; epistome with prominently blunt posterior angles and bearing 2 pairs of epistomal sensory pits in the centre, the pairs situated at some distance from each other but at the same level; each pit contains one sensilla, the two internal pits each contain one trichoid while the two external pits each contain one campaniform sensilla (Fig. 19). Clypeus (Fig. 20) narrow, membranous, glabrous, anterior margin mostly straight. Labrum (Fig. 20) transverse, about 1.8 times wider than long, mostly membranous but bearing very prominent palantine sclerites with 4 long bristles, 2 short bristles and 4 campaniform sensillae on the external surface and 6 blunt bristles on the internal surface (epipharynx). The external branches of the palantine sclerites are curved internally. Anterior margin of labrum convex, with a fringe of sparse, short, sharp setae arising from large, membranous tubercles in the centre (midline) and with a denser fringe of longer setae along the margin. Labrum ventrally (epipharynx) with short teeth arising from large tubercles in the anteriorlateral regions and



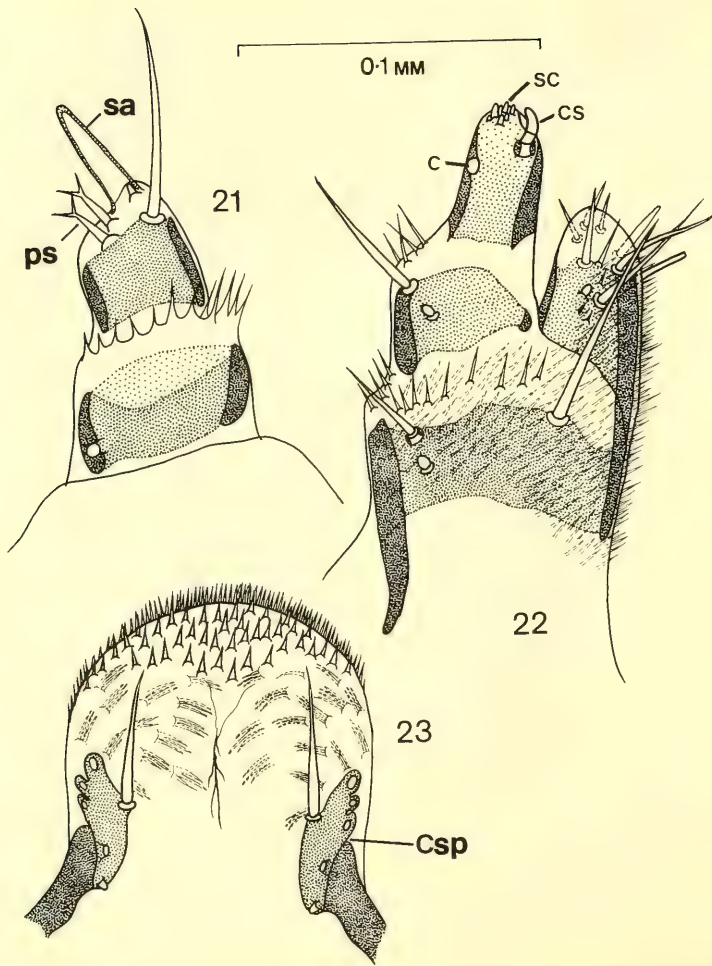
Figs 14–18. *Ethon affine* Laporte & Gory. 14. Dorsal view of larva/prepupa, showing microspinulae and a bristle on the lateral part of the pronotum (*a*) and tubercles on the lateral portion of the 1st abdominal segment (*b*). 15. Pronotal plate. 16. Prosternal plate. 17. Right mandible, dorsal view. 18. Left mandible, ventral view showing prosteca (*ps*).

with narrower teeth arising in groups of 2–5 from common tubercles in the central (midline) region. Antennae (Fig. 21): 2-segmented; 1st segment broadly cylindrical, strongly sclerotized, about 1.2–1.3 times wider than long, with one large campaniform sensilla near the lateral-posterior margin and a fringe of short microspinulae on the anterior margin; 2nd segment about 1.2 times longer than wide, more or less cylindrical, with a very long, sharp seta (trichosensilla) near the apex, a prominent sensory appendage at the apex, two clearly visible palmate sensillae near the sensory appendage and a small, basiconic sensilla at the base of the sensory appendage; microspinulae absent. Mandibles (Figs 17, 18): black, short, broad at the base with 3 teeth at the apex, apical tooth the largest; internal margin with prosteca (Fig. 17, *ps*) bearing very dense short bristles; mandibles correspond to those of the 2nd morpho-ecological type of *Acmaeoderella* larvae (Volkovitsh 1979). Labio-maxillary complex (Figs 22, 23): Maxillae (Fig. 22): Maxillary basis (cardo) mostly membranous, glabrous, without setae. Stipes (Fig. 22) moderately sclerotized bearing one campaniform sensilla in the lower half near the lateral external margin and one short, sharp bristle near the lateral external margin above the campaniform sen-



Figs 19–20. *Ethon affine* Laporte & Gory. 19. Epistome. 20. Labrum showing armature, sensillae and palatine sclerite (*ps*).

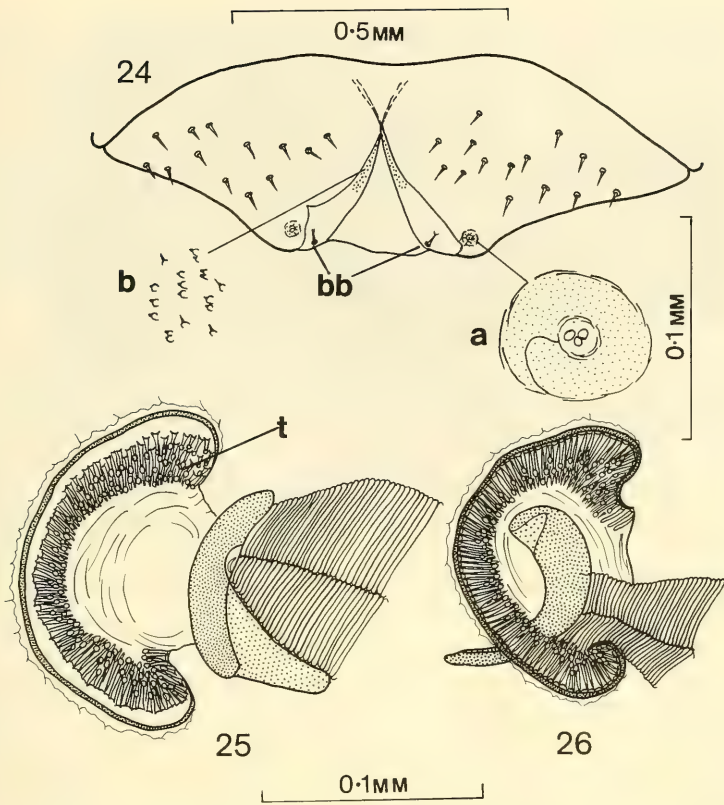
silla, and one very long, sharp seta near the anterior margin below the mala; anterior margin of stipes with sparse, short microspinulae externally and stipes with a dense covering of microspinulae internally. Maxillary palpus (Fig. 22): 2-segmented, basal segment transverse, about 1.5 times wider than long, shorter than the 2nd segment, with one campaniform sensilla on the sclerotized area about half-way from the midline to the lateral external margin, one long bristle arising from near the anterior-lateral margin and with several microspinulae in a short cluster at the anterior-lateral angle; 2nd segment about 1.8 times longer than wide, with one campaniform sensilla on the external margin, one modified curved sensilla internally near the anterior margin and 6–8 sensory cones at the apex. Mala (Fig. 22) about 1.6–1.8 times longer than wide, with one campaniform sensilla near the centre and with 3 bristles on the external surface, the internalmost bristle shorter than the other two, and with 3 short, sharp and 4 long, blunt, large bristles and a dense covering of microspinulae internally. Labium (Fig. 23) prominently arcuate, about as long as wide; prementum with a triangular-shaped zone of sparse microteeth on the anterior margin and midline; lateral (corner) sclerites of prementum strongly developed, each with 5 small, campaniform sensillae and one long, sharp seta reaching the apex of the zone of microteeth; hypopharynx with slender ciliae arising in groups of 2–4 from common tubercles; postmentum without bristles.



Figs 21–23. *Ethon affine* Laporte & Gory. 21. Antenna showing sensory appendage (*sa*) and palmate sensilla (*ps*). 22. Maxilla showing arrangement of armature and curved sensilla (*cs*), sensory cones (*sc*) and campaniform sensilla (*c*). 23. Labium showing armature and lateral (corner) sclerite of prementum (*csp*).

Thorax (Figs 14–16). Pronotal plate (Fig. 15) glabrous around the groove, with only a few sparse, short bristles; microteeth arising from tubercles on the remaining surface (Fig. 14a); on the margins of the pronotal plate, the microteeth are worn down and only tubercles are retained (Fig. 14b); pronotal groove weakly defined, not sclerotized and colourless, more prominent at the posterior $\frac{1}{3}$ of plate only. Prosternal plate (Fig. 16) glabrous, with very sparse, short bristles and with a scarcely visible sculpture at the posterior $\frac{1}{3}$; prosternal groove faint, weakly developed, weakly sclerotized at the posterior $\frac{1}{2}$ only, narrowed towards the posterior margin. Mesothorax and metathorax completely covered by microteeth (Fig. 14a), which are reduced to rounded tubercles in the middle of the segments (Fig. 14b) and sparse bristles. Thorax without ambulatory pads and rudiments of legs.

Abdomen (Figs 14, 24, 27). Abdominal segments pale cream in colour, often darkening in alcohol, cylindrical; segments 1–4 about the same width as the meso- and metathorax and also same width as each other (2.0–2.5 times wider than long), without ambulatory pads; segments 5–10 progressively smaller in size, the last segment the smallest. Dorsal surface of abdomen glabrous in the middle, with



Figs 24–26. *Ethon affine* Laporte & Gory. 24. Anal segment showing armature, sunken sensory structures (*a*), tubercles (*b*) and small, branched setae (*bb*). 25. Thoracal left spiracle, trabeculae (*t*). 26. Left spiracle on the 2nd abdominal segment.

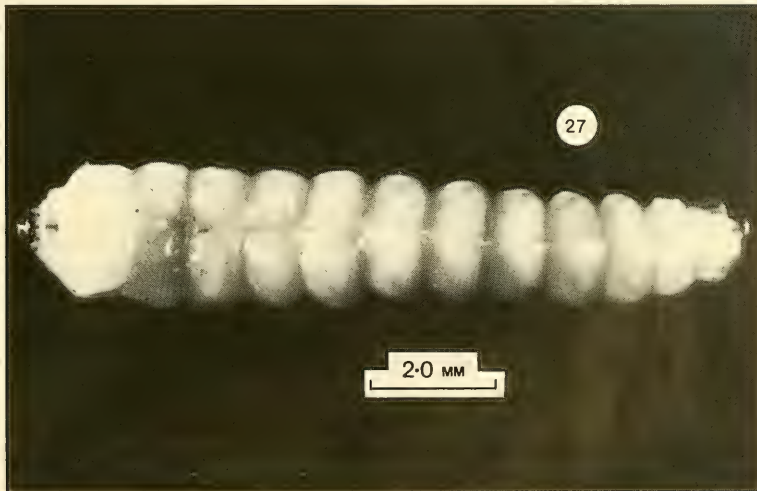


Fig. 27. Dorsal view of last instar larva of *Ethon affine* Laporte & Gory freshly collected from a gall on a living stem of *Pultenaea flexilis* Sm. (Fabaceae). Photo: T. J. Hawkeswood.



Fig. 28. Gall of *Ethon affine* Laporte & Gory on the stem of *Pultenaea flexilis* Sm. (Fabaceae) cut open to expose a teneral adult (*a*). Photo: M. Peterson.

microteeth and sparse, short bristles only on the lateral parts of segments 1–8; 9th segment with sparse, short bristles in the middle. Ventral surface of abdomen completely covered with microteeth (Fig. 14a) changing to tubercles in the median region (Fig. 14b); 9th segment glabrous; anal segment (Fig. 24) without supporting processes (as is found in the typical Agrilinae) but with weakly sclerotized structures at the apex (Fig. 24a); each sclerotized structure contains 3 sunken sensillae; a zone of small tubercles and small branched bristles (Fig. 24, *bb*) along the anal fissures. Spiracles (Figs 25, 26) are of the circular type characteristic of the Agrilinae, weakly sclerotized, with relatively long, unbranched trabeculae (Fig. 25, *t*); thoracic and abdominal spiracles are similar, differing only in size.

Material examined. 4 last instar and 2 earlier instar larvae, Epping, Sydney, New South Wales, Australia, ex galls on living stems of *Pultenaea flexilis* Sm. (Fabaceae), 1 October 1977, collected by C. E. Chadwick; 5, various instars and prepupae, West Pymble, Sydney, New South Wales, ex galls on *P. flexilis* Sm., 11 April 1982, collected by C. E. Chadwick; 3 last instar larvae/prepupae, Pearl Beach, Sydney, New South Wales, ex galls on living *P. flexilis* Sm., 6 May 1982, collected by C. E. Chadwick.

Discussion

Agrilus australasiae Laporte & Gory

For a comparison of the larvae of *Agrilus australasiae* with Palearctic species, we have studied the larvae of the following eight species: *Agrilus viridis* (L.), *A. ribesi* Schaeff., *A. cuprescens* Mén., *A. sulcicollis* Lac., *A. bastulifer* Ratz., *A. angustulus* (Ill.), *A. ater* (L.) and *A. biguttatus* (Fabr.). According to the armature of the labrum and that of the internal surface of the maxillae (both features have not been used as a diagnostic character until now), these may be divided into two groups based on larval morphology:

(a) the *viridis*-group, comprised of *A. viridis*, *A. ribesi*, *A. cuprescens*, *A. sulcicollis*, *A. bastulifer* and *A. angustulus*. These species are characterized in having the anterior margin of the labrum gla-

brous externally and internally, a membranous projection bearing a fringe of very large cilia (Alexeev 1960, Fig. 2) between the maxillary stipes and the base of the maxillary palpus, and cilia being concentrated near the apex of the mala and on the internal surface of the stipes and cardo as well.

(b) the *ater*-group, comprised of *A. ater* and *A. biguttatus*. These two species are characterized in having the anterior margin of the labrum bearing dense bristles externally, the epipharynx with very dense microspinulae and the internal surface of the maxillae uniformly covered with cilia, being without distinct zones of concentration.

According to its larval morphology outlined in the present paper, the larva of *A. australasiae* is more closely related to the *ater*-group, but differs by not having bristles on the external margin of the labrum (Fig. 7). The armature of the epipharynx and internal surface of the maxillae of *A. australasiae* is very similar to that of those larvae of the *ater*-group. It is possible that the species of the *ater*-group are more primitive than those of the *viridis*-group and have a more ancient origin and a closer relationship with Palaeotropic and Australian groups. The members of the *viridis*-group have specialized and advanced morphological features such as the reduction of the armature (i. e. bristles or microteeth) of the mouthparts, which are characteristic of advanced and specialized taxa (e. g. Acmaeoderini, Anthaxini, Cylindromorphinae and Trachyinae).

Alexeev (1960, 1981) used the following morphological features for identification of various Palaearctic *Agrilus* species: the form and coloration of the prothoracic grooves; the armature of the anterior margin of the prementum (regarded by us as the structures comprising microteeth, microspinulae and the form and size of the micro-spinulated zones); the form and correlation of segments of the anal supporting processes and the arrangement of the internal lubricating glands of these processes. These characters are very reliable for identification of the closely related Palaearctic species and should also be very useful in the identification of Australian species of *Agrilus* as well as for *Agrilus* species from other regions.

Ethon affine Laporte & Gory

There appear to be no doubts regarding the close relationship between Australian and Palaearctic species of *Agrilus* based on larval morphology but the taxonomic position of *Ethon* must be examined with special consideration since its relationship with other Agrilinae is not very clear. Except for the larvae of the *Agrilus* and *Ethon* (described in this paper), the only other larva of an Australian Agrilinae that has been studied is that of *Synechocera tasmanica* Thery from the tribe Coraebini (Bellamy 1987). However, although the description of this species is inadequate, it is evident that the larva of *S. tasmanica* possesses the typical anal supporting processes characteristic of larval Agrilinae.

Théry in Carter (1929: 268) placed *Ethon* in the tribe Agrilini (subtribe Agrili) of the subfamily Buprestinae with such genera as *Agrilus*, *Alcinous*, *Cisseis* and its subgenera *Dinocephalia*, *Hypocisseis*, *Meliboeithon*, *Neospades*, *Pachycisseis*, *Paracephala* and *Synechocera*. Hawkeswood & Peterson (1982) followed Carter's (1929) classification in the placement of *Ethon*. Bellamy (1985, 1986) placed *Ethon* in the tribe Coraebini of the subfamily Agrilinae with *Alcinous*, *Amorphosoma*, *Cisseioides*, *Cisseis*, *Coraebus*, *Dinocephalia* (as genus), *Hypocisseis* (as genus), *Meliboeithon* (as genus), *Paracephala*, *Polyonychus*, *Pseudosynechocera* and *Synechocera* and placed *Agrilus* in the tribe Agrilini by itself (Bellamy 1986). Since larvae of most of the above genera are unknown, larval material of the following Palaearctic and Palaetropic buprestids from the subfamilies Agrilinae, Cylindromorphinae and Trachyinae were studied for comparative purposes: Agrilinae, Agrilini: *Agrilus angustulus* (Ill.), *A. ater* (L.), *A. biguttatus* (F.), *A. cuprescens* Mén., *A. hastulifer* Ratz., *A. ribesi* Schaeff., *A. sulcicollis* Lac., and *A. viridis* (L.); Agrilinae, Coraebini: *Clema deserti* Sem., *Coraebus elatus* (Gmel.), *C. florentinus* (Hbst.), *C. rubi* (L.), *Meliboeus amethystinus* (Ol.) and *M. robustus* (Kust.); Cylindromorphinae, Cylindromorphini: *Cylindromorphus pyrethri* (Stierl.) and *Paracylindromorphus subulifor-*

mis (Mannh.); Trachyinae, Aphanisticini: *Aphanisticus cochinchinae seminulum* Obenb.* and Trachyinae, Trachyini: *Trachys turanus* Sem. In addition to this material, we have also used the larval descriptions of various species from these groups published by Bílý (1983, 1986), Cobos (1986), Falcoz (1923) and Schaefer (1949, 1955).

The results of our morphological analysis of larva of the tribes Agrilinae, Cylindromorphinae and Trachyinae are shown in Table 1. As can be clearly seen, the larval morphology of *Ethon affine* is very different from other Agrilinae (Table 1), but it also shows that all genera listed in Table 1 belong to the same agrilinoid phylogenetic line. The larvae of taxa belonging to this lineage are characterized in having spiracles of a circular type, by the presence of mandibular prosteca, and by the absence of a proventriculus (the latter feature was described by Danilevsky (1979). The specialized features, which have been adapted for feeding on soft tissues of grass stalks (*Aphanisticus*, *Cylindromorphus* and *Paracylindromorphus*) or leaves (*Trachys*) are most highly developed in *Aphanisticus*. For this evolutionary change from hard wood to softer plant tissues, their larvae have a complete fusion of the maxillary elements and there is also a tendency of similar mergence of mouthparts in the larvae of *Cylindromorphus*, *Paracylindromorphus* and *Trachys*. The larva of *Ethon affine* possesses some of the most primitive buprestid morphological features among Agrilinae, e. g. the absence of anal supporting processes. These specialized structures are possessed by both the Coraebini and Agrilini. There are many other similarities between the larvae of Coraebini and Agrilini. Of the Coraebini studied here, only *Clema* shows specialized features, e. g. well developed fans of bristles on the epipharynx and hypopharynx. In our opinion, this feature can be explained by the association of *Clema* with grasses, viz. larvae of *Clema deserti* breed (Kaplín 1978) in the stems of *Aristida karelinii* and *A. pennata* (Liliidae: Commelinales: Poales: Poaceae: Aristideae) (Takhtajan 1987).

In conclusion, we are of the opinion that the inclusion of *Ethon* amongst the Coraebini seems unfounded because larval *Ethon affine* lacks the anal supporting processes, while the form of the body, sculpture of the prothoracal plates and the armature of the mouthparts are different from Coraebini. On the other hand, larval *Ethon* possesses a number of characteristics, e. g. antennal structure, absence of anal supporting processes and labrum structure) which conform to typical Trachyinae. It is therefore possible that *Ethon* holds an intermediate position between Agrilinae and Trachyinae and as such, should be placed, at least, in a separate tribe. A revision of both adult and larval Agrilini and Coraebini of Australia should be undertaken to clarify the true relationships of *Ethon*.

Acknowledgements

We would like to thank Dr S. Bílý, National Museum, Prague, Czechoslovakia for the loan of the larvae of *Aphanisticus* and for correspondence and reprints, Dr A. V. Alexeev, Orekhovo-Zuevo, USSR, for the loan of the larvae of *Clema*, *Coraebus*, *Cylindromorphus*, *Meliboeus* and *Paracylindromorphus*, Mr C. E. Chadwick, Sydney, Australia for collecting the *Ethon* material and sending it to the junior author, Dr J. F. Lawrence, Canberra, Australia, for sending all the Australian *Agrilus* and *Ethon* material to the senior author and to Magnus Peterson of Perth, Western Australia for the photograph of the gall (Fig. 28) of *E. affine*.

Corrections

We take this opportunity to correct some mistakes which appeared in our earlier paper on Australian buprestid larvae viz. Volkovitsh & Hawkeswood 1987, Zool. Anz. 219: 274–282.

Page 276. "Labrum dorsally" is not the hypopharynx, but merely the dorsal surface of the labrum; the ventral surface of the labrum is the epipharynx while the dorsal surface of the labium is the hypopharynx.

* 1 In our opinion, *Aphanisticus*, according to its larval morphology, is more closely related to the Cylindromorphinae than Trachyinae; however this taxonomic problem awaits further research and discussion.

Page 276. Last paragraph. "maxillary palpus (cardo)" should read "maxillary basis (cardo)".

Page 277. Caption for fig. 15 should read "Labrum" instead of "Labium".

Page 278. re. Fig. 17. The sclerites of the labium we have named as the palantine sclerites (*ps*) are really the lateral (corner) sclerites of the prementum; the true palantine sclerites are situated on the labrum only.

Page 279. Table 1. Replace "Hypopharynx" with "Labrum dorsally" in each of the columns.

Page 280. Table 1. Kisanthobini, paragraph 4, last line, replace "microspinulae absent" with "microampullae absent".

References

- Alexeev, A. V. 1960. On the morphology and systematics of larvae of the genus *Agrilus* Curt. in the European part of the USSR (Coleoptera, Buprestidae). — Zool. Zh. **39**: 1497–1510 (In Russian)
- 1981. The determination of larvae of the genus *Agrilus* Curtis (Coleoptera, Buprestidae) from the European part of the USSR. — Sbornik Trudov Zool. Mus. Moscow State Univ. **19**: 65–84 (In Russian)
- Bellamy, C. L. 1985. A catalogue of the higher taxa of the family Buprestidae (Coleoptera). — Navors. Nas. Mus. (Bloemfontein) **4**: 405–472
- 1986. The higher classification of Australian Buprestidae, with the description of a new genus and species (Coleoptera). — Aust. J. Zool. **34**: 583–600
- 1987. A revision of the genus *Synechocera* Deyrolle (Coleoptera: Buprestidae: Agrilinae). — Invert. Taxon. **1**: 17–34
- Bilý, S. 1983. Larvae of *Julodis variolaris freygegneri* Obenberger and *Paracylindromorphus transversicollis* (Reiter) (Coleoptera, Buprestidae). — Acta Ent. Bohemoslav. **80**: 65–70
- 1986. Descriptions of adult larvae of *Thrinopyge alacris* Le Conte and *Aphanisticus cochinchinae seminulum* Obenberger (Coleoptera, Buprestidae). — Ent. Pap. pres. Y. Kurosawa, Tokyo: 198–204
- Carter, H. J. 1929. A check list of the Australian Buprestidae. — Aust. Zool. **5**: 265–304
- Cobos, A. 1986. Fauna Iberica de Coleopteros Buprestidae. — 426 pp
- Danilevsky, M. L. 1979. Anatomy of the digestive system in Buprestidae larvae (Coleoptera). In: Pravdin, F. N. (ed.) Stem boring insects and their entomophages. — Nauka (Moscow): 158–167 (In Russian)
- Falcoz, L. 1923. Description de la larve de *Coraebus sinuatus* Creutzer (Col., Buprestidae). — Ann. Soc. Ent. France **92**: 247–252
- Froggatt, W. W. 1892. Gall-making buprestids. — Proc. Linn. Soc. N. S. W. **7**: 323–326
- Hawkeswood, T. J. 1981. Observations on two sympatric species of Buprestidae (Coleoptera) from sand dunes on the north coast of New South Wales. — Vict. Nat. **98**: 146–151
- 1988. A review of larval host records for twelve Australian Buprestidae (Coleoptera). — G. It. Ent. **4**: 81–88
- & Peterson, M. 1982. A review of larval host records for Australian jewel beetles (Coleoptera: Buprestidae). — Vict. Nat. **99**: 240–251
- Kaplin, V. G. 1978. On peculiarities of *Clema deserti* Sem. interrelation with fodder plants in Eastern Karakum. — Proc. Acad. Sci. Turkmen SSR, Ser. Biol. Sci. **N1**: 44–49 (In Russian)
- Obenberger, J. 1959. Druhy rodu *Agrilus* Curtis z Australie a Oceanie. Sur les espèces du genre *Agrilus* Curtis de l'Australie et Océanie (Coleoptera, Buprestidae). — Acta Ent. Mus. Nat. Pragae **33**: 223–240
- Schaefer, L. 1949. Les Buprestides de France. — Misc. Ent. Suppl.: 1–511
- 1955. Les Buprestides de France. — Suppl. Misc., Ent. **48**: 1–41
- Takhtajan, A. 1987. Systema Magnoliophytorum. — Leningrad, "Nauka": 1–439 (In Russian)
- Volkovitch, M. G. 1979. On the larval morphology of buprestid beetles of the genus *Acmaeoderella* Cobos (Coleoptera, Buprestidae). — Proc. Zool. Inst. Acad. Sci. USSR **83**: 21–38 (In Russian)
- & Danilevsky, M. L. 1987. Larvae of some buprestid species of the tribe Acmaeoderini (Coleoptera, Buprestidae). — Proc. Zool. Inst. **170**: 52–61 (In Russian)
- & Hawkeswood, T. J. 1987. The larva of *Neocuris gracilis* Macleay (Coleoptera: Buprestidae). — Zool. Anz. **219**: 274–282
- Williams, G. A. & Williams, T. 1983. A list of the Buprestidae (Coleoptera) of the Sydney basin, New South Wales, with adult food plant records and biological notes on food plant associations. — Aust. Ent. Mag. **9**: 81–93

Table 1. Comparison of the main taxonomic characters between the larvae of *Eibon* and those of *Agrius*, *Coracbus*, *Meliboeus*, *Clema*, *Paracylindromorphus*, *Cylindromorphus*, *Aphanisticus* and *Trachys*.

Characteristics		Agrillinae		Cylindromorphinae		Trachyinae	
Form of body	Maximum width at the middle, at the prothorax and/or prothorax not wider than other segments (Fig. 14)	1	2	1	1	1	1
	Maximum width at the prothorax	1	2	1	1	1	1
Pronotal groove	laterally (Fig. 14 a, b)	1	2	1	1	1	1
	Glabrous, with tubercles and microceath (Fig. 1 a)	1	2	1	1	1	1
Prothoracical plates	covered with microceath (Fig. 1 a)	1	2	1	1	1	1
	covered with microceath and tubercles	1	2	1	1	1	1
Anal segment	Without supporting processes or tubercles (Fig. 24)	1	2	1	1	1	1
	With segmented supporting processes	1	2	1	1	1	1
Antennae	Normal, 2-segmented (Fig. 21)	1	2	1	1	1	1
	Normal, 2-segmented (Fig. 9)	1	2	1	1	1	1

